State of Utah

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Department of Administrative Services
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Director

ADDENDUM #4

Date:	July 19, 2007		
To:	Kurt Baxter, Project Manager, DFCM		
Reference:	Snow College – Ephraim, Utah Library/Classroom Building - Programming DFCM Project No. 07258700		
Subject:	**Addendum No. 4**		
Pages	Addendum	1	page
	Geotechnical Report	27	pages
	Total	**28**	**pages**

Note: This Addendum shall be included as part of the Contract Documents. Items in this Addendum apply to all drawings and specification sections whether referenced or not involving the portion of the work added, deleted, modified, or otherwise addressed in the Addendum. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

1. **SCHEDULE CHANGES – There are no changes to the Project Schedule.**

2. **GENERAL – See Attached 27 page Geotechnical Report.**

End of Addendum #4

REPORT
GEOTECHNICAL STUDY
PROPOSED PERFORMING ARTS CENTER/CLASSROOMS BUILDING
NORTHEAST CORNER OF 100 EAST AND CENTER STREET
SNOW COLLEGE CAMPUS
EPHRAIM, UTAH

Submitted To:

State of Utah
Division of Facilities Construction and Management
4110 State Office Building
Salt Lake City, Utah 84114

Submitted By:

AMEC Earth & Environmental, Inc.
Salt Lake City, Utah

August 7, 2001

Job No. 1-817-003579

August 7, 2001
Job No. 1-817-003579

State of Utah
Division of Facilities Construction and Management
4110 State Office Building
Salt Lake City, Utah 84114

Attention: Mr. David McKay

Gentlemen:

Re: Report
Geotechnical Study
Proposed Performing Arts Center/Classrooms Building
Northeast Corner of 100 East and Center Street
Snow College Campus
Ephraim, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed at the site of the proposed performing arts center/classrooms building which is located on the northeast corner of 100 East and Center Street on the Snow College Campus in Ephraim, Utah. The general location of the site with respect to major topographic features and existing facilities, as of 1966, is presented on Figure 1, Vicinity Map. A more detailed layout of the site showing existing and proposed buildings with regard to adjoining streets is presented on Figure 2, Site Plan. The locations of the eight borings drilled in conjunction with this study are also presented on Figure 2.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of our study were planned in discussions between Mr. David McKay from the State of Utah, Division of Facilities Construction and Management, and Mr. Bill Gordon of AMEC Earth & Environmental, Inc. (AMEC).

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In general, the objectives of this study were to:

1. Define and evaluate the subsurface soil and groundwater conditions across the site.

2. Provide appropriate foundation and earthwork recommendations to be utilized in the design and construction of the proposed structure.

In accomplishing these objectives, our scope has included the following:

1. A field program consisting of the drilling, logging, and sampling of eight exploration borings.

2. A laboratory testing program.

3. An office program consisting of the correlation of available data, engineering analyses, and the preparation of this summary report.

1.3 AUTHORIZATION

Authorization was provided by Mr. David McKay of the State of Utah, Division of Facilities Construction and Management.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the exploration borings, projected groundwater conditions, and the layout and design data discussed in Section 2., Proposed Construction, of this report. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, AMEC must be informed so that our recommendations can be reviewed and amended, if necessary. This report is only for use in the design of the structure presented in the proposed construction section of this report. Any additional structures, additions, etc. are not covered in this report and AMEC must be contacted to evaluate the situation.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices at this time.

2. PROPOSED CONSTRUCTION

A performing arts center/classrooms building is to be constructed. The overall facility will be roughly rectangular with overall dimensions of approximately 400 by 150 feet, with the longer dimension in the east-west direction. The classroom areas will be one to two-levels, and the concert hall and auditorium areas will be one extended level with balconies, high stage storage areas, and orchestra pits. The structure will be established slab-on-grade with possible tunnels, elevator, and orchestra pits extending up to five feet below existing grade. It is projected that the structure will be of masonry and metal truss construction with light weight concrete structural floors.

Structural loads will be transmitted down through columns and bearing walls to the supporting foundations. We project that the maximum column and wall loads for the two and one-extended levels of the facility will be on the order of 150 to 200 kips and 6 to 8 kips per lineal foot, respectively. Loads associated with the one-story structure will be light. We project that the floor slab loads will be light (less than 200 pounds per square foot).

Maximum site grading cuts and fills at the site are anticipated to be less than four feet to achieve final grades.

3. SITE INVESTIGATIONS

3.1 FIELD PROGRAM

In order to define and evaluate the subsurface soil and groundwater conditions across the overall site, 8 exploration borings were drilled to depths ranging from 15.0 to 41.5 feet below existing grade. The borings were drilled using a rubber tire-mounted all-terrain-type rotary drill rig equipped with hollow-stem augers. Locations of the borings are presented on Figure 2.

The field portion of our study was under the direct control and continual supervision of an experienced member of our geotechnical staff. During the course of the drilling operations, a continuous log of the subsurface conditions encountered was maintained. In addition, relatively undisturbed samples of the typical soils penetrated were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural examination. These classifications were later supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3H, Log of Borings. Soils were classified in accordance with the nomenclature described on Figure 4, Unified Soil Classification System.

Following completion of drilling operations, slotted PVC pipe was installed in Boring B-1 in order to provide a means of monitoring the groundwater fluctuations.

3.2 LABORATORY TESTING

3.2.1 General

In order to provide data necessary for our engineering analyses, a laboratory testing program was initiated. The program included moisture, density, collapse/consolidation, and chemical tests. The following paragraphs describe the tests and summarize the test data.

3.2.2 Moisture and Density Tests

To provide index parameters and to correlate other test data, moisture and density tests were performed on selected undisturbed samples. The results of these tests are presented to the left on the boring logs, Figures 3A through 3H.

3.2.3 Collapse/Consolidation Tests

To provide data necessary for our settlement analyses, a collapse/consolidation test was performed on each of seven representative samples of the finer-grained soils encountered in the exploration borings. The collapse portion of the overall test was performed in accordance with the following procedure:

1. The sample is loaded to a specified axial pressure at in-situ moisture content.
2. The resulting axial deflection is measured and recorded.
3. The sample is saturated.
4. The resulting collapse is measured and recorded.

A tabulation of the results of the collapse portion of the test is presented below:

Boring No.	Depth (feet)	Soil Type	Natural Dry Density (pcf)	Natural Moisture Content (percent)	Axial Load When Saturated (psf)	Collapse (-) or Swell (+) (percent)
B-2	2.5	CL	91	22.8	1,600	- 2.4
B-2	20.5	CL/ML	107	21.4	1,600	- 1.1
B-4	5.5	CL/ML	85	13.7	1,600	- 5.1
B-4	15.5	CL/ML	92	13.8	1,600	- 2.3

Boring No.	Depth (feet)	Soil Type	Natural Dry Density (pcf)	Natural Moisture Content (percent)	Axial Load When Saturated (psf)	Collapse (-) or Swell (+) (percent)
B-4	20.5	CL/ML	92	8.9	1,600	- 3.4
B-5	8.0	CL/ML	104	24.1	1,600	- 0.9
B-6	3.5	CL/ML	91	16.0	1,600	- 0.7

Those sample which collapsed less than 1 percent are considered non-collapsible or only slightly collapsible with the majority of the measured collapse being attributed to sample disturbance. Upon completion of the collapse portion of the tests, standard consolidation test load was performed. The results of these tests indicate that the soils which exhibit collapse characteristics (greater than 1 percent) are highly compressible and exhibit low preconsolidation pressures. The consolidation tests performed on the samples that are not collapsible indicate that the soils are moderately to highly over-consolidated and when loaded below the over-consolidated pressure will exhibit relatively low compressibility characteristics. Detailed results of these tests are maintained within our files and can be transmitted to you, upon your request.

3.2.4 Chemical Tests

To determine where site soils will react detrimentally with concrete, chemical tests were performed. The results of these tests are tabulated below:

Boring No.	Depth (feet)	Soil Classification	pH	Water Soluble Sulfate (ppm)
B-5	1.5	ML-CL	7.6	<10

These results indicate that the native soils will have negligible corrosive effects on concrete.

4. SITE CONDITIONS

4.1 SURFACE

The site is located on the northeast corner of 100 East Street and Center Street on the campus of Snow College in Ephraim, Utah. The south boundary of the site is Center Street, and the west is

100 East Street and a series of one to two level brick buildings. To the east is an asphalt-paved parking lot and to the north is a water feature and additional brick buildings.

The site is currently occupied by four structures. These structures are one to two levels established near grade, with the north end of the easternmost building having a walk-out basement. The structures are of mainly of brick construction and their foundations appeared to be in good condition. Concrete sidewalks are at various locations across the site. Vegetation consists of short grass with scattered bushes and trees. The site grades downward slightly to the west. There is also an area that is depressed a few feet in the northeast portion of the site.

4.2 SUBSURFACE SOIL

The soil conditions encountered in each of the borings, to the depths penetrated, were somewhat similar. In general the native soils encountered at the site, which underlay up to five feet of non-engineered fills, consist primarily of 23.0 to 27.5 feet of silty clays, silty clays/clayey silts, sequences of alternating up to six-inch layers of fine sandy silt, silty clay, and clayey silt underlain by very dense sands and gravels. Within the upper fine-grained soil zones, significant layers of sands and gravels and sands were encountered.

Pavement consisting of four inches of asphalt underlain by eight inches of road base was encountered at Boring B-1. At the other seven borings, within the upper four inches of the surface soils/fills, major roots (topsoil) were encountered. Topsoil will exhibit poor engineering characteristics. Non-engineered fills were encountered to depths ranging from one and one-half to five feet below existing grade in Borings B-3, B-4, B-6, B-7, and B-8. These fills consist of a mixture of silt and clay with varying amounts of sand, with some layers containing gravel, vary in density, are dark brown, moist, and will exhibit variable and, in many cases, poor engineering characteristics.

Beneath the surficial fills/pavements and from the surface at Borings B-2 and B-5, variable fine gravel soils were encountered in the deeper borings to the depths ranging from 23.0 to 27.5 feet below existing grade. Some of these layered soil, contain a pinhole-type structure which is indicative of a moisture sensitive soil. Moisture sensitivity, in this case, is defined as the characteristic of a soil to exhibit moderately high strength and low compressibility characteristics when dry, but to lose strength, become highly compressible, and collapse when saturated. Laboratory data shows that these layered soils are not or only slightly collapsible. Where non-collapsible, they exhibit relatively high strength and low compressibility characteristics. The non-layered fine-grained soils have a more significant pinhole structure and were found to be moderately (2.3 to 5.7 percent) collapsible. The non-collapsible and collapsible soils are variable laterally and vertically in the subsurface sequence.

The underlying sands and gravels are generally dense to very dense, brown, dry to very moist, will exhibit high strength and low compressibility characteristics within the anticipated loading range, and are not collapsible.

The lines designating the interface between soil types on the boring logs generally represent approximate boundaries. In-situ, the transition between soil types may be gradual.

4.3 GROUNDWATER

The day of the drilling and sampling operations, groundwater was not encountered in any of the borings. To facilitate monitoring future groundwater fluctuations, prior to backfilling Boring B-1, slotted PVC pipe was installed.

Seasonal and longer-term groundwater fluctuations on the order of two to three feet should be anticipated. The highest seasonal levels will generally occur during the late spring and summer months.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

The primary geotechnical aspect of the site that will most influence the design, construction, and long-term performance of the proposed facilities are the collapsible soils found randomly in the upper 23.0 to 27.5 feet of the deep borings. Many of the tested soils have a collapse potential of 2.3 to 5.1 percent under an axial pressure of 1,600 pounds per square foot. These soils could settle under approximately one-quarter to more than one-half of an inch per foot of collapsible soils.

To control the potential settlements, we recommend that the structure be supported upon a drilled pier-grade beam system. Floor slabs should also be structurally supported.

Pavements and outside flatwork may be established upon properly prepared suitable undisturbed natural soils, and/or upon structural fill extending to properly prepared suitable undisturbed natural soils. Pavements and outside flatwork may be established overlying moisture sensitive soils with the understanding that some movements may occur. Movements can be somewhat controlled and delayed by reducing infiltration of water into the subsurface sequence.

Detailed discussions pertaining to earthwork, foundations, floor slabs, lateral resistance, pavements, and the geoseismic setting of the site are discussed in the following sections.

5.2 EARTHWORK

5.2.1 Site Preparation

Preparation of the site will consist of the demolition of the existing structure followed by the removal of all of the non-engineered fill, surface vegetation, topsoil, and other deleterious materials from beneath an area extending at least three feet beyond the perimeter of proposed building areas. Footings and floor slabs associated with the existing building must be totally removed. In flexible pavement and outside flatwork areas, vegetation, topsoil, non-engineered fills, and other deleterious materials must be removed. Existing footings in these areas should be removed to a depth of at least 12 inches below new construction. Prior to the placement of structural fill, outside flatwork, and pavements over natural soils, the subgrade must be proofrolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If any loose, soft, or disturbed zones are encountered, they must be removed to a maximum depth of two feet and replaced with compacted structural fill.

Surface vegetation and other deleterious materials should generally be removed from the site. Topsoil, although unsuitable for utilization as structural fill, may be stockpiled for subsequent landscaping purposes.

5.2.2 Excavations

Temporary construction excavations not exceeding four feet in depth above or below the water table in cohesive soils may be constructed with near-vertical sideslopes.

Deeper construction excavations up to ten feet in depth in the cohesive soils above or below the water table may be constructed with sideslopes no steeper than one-half horizontal to one vertical. If excessive sloughing occurs, or if extensive layers of clean granular soils are encountered, the sideslopes should be flattened. Additionally, if excavations encounter clean granular soils below the groundwater table, much flatter sideslopes, shoring and bracing, and/or dewatering will be required.

All excavations must be inspected periodically by qualified personnel. If any signs of instability are noted, immediate remedial action must be initiated.

5.2.3 Structural Fill

Structural fill will be required as site grading fill and as backfill over foundations and utilities. All structural fill must be free of sod, rubbish, construction debris, frozen soil, and other deleterious materials. Structural site grading fill is defined as fill placed over fairly large open areas to raise the overall site grade. The maximum particle size within structural site grading fill should generally not exceed four inches; although, occasional particles up to six to eight inches may be incorporated provided that they do not result in "honeycombing" or preclude the obtainment of the desired degree of compaction. In confined areas, the maximum particle size should generally be restricted to two and one-half inches. So that the compacted fill is essentially impermeable, we recommend that granular soils be well-graded and contain at least 30 percent fines. Maximum plasticity index of the fine-grained soils should not exceed 20 percent.

On-site fine-grained soils may be re-utilized as structural site grading fill if they do not contain significant amounts of deleterious material. These fine-grained soils will require that very close moisture control be maintained during placement and compaction. It may be very difficult, if not impossible, to properly place and compact these fills during wet and cold periods of the year. Only granular soils, such as well-graded mixtures of sands and gravels with at least 25 percent fines, should be used in confined areas.

5.2.4 Fill Placement and Compaction

All other structural fill should be placed in lifts not exceeding eight inches in loose thickness. Fills in excess of 5 feet thick, and beneath all footings and floor slabs, should be compacted to at least 95 percent of the maximum dry density as determined by the AASHTO[1] T-180 (ASTM[2] D-1557) compaction criteria. All other structural fill should be compacted to at least 90 percent of the above criteria.

Prior to the placement of structural site grading fill, the exposed subgrade must be prepared as discussed in Section 5.2.1, Site Preparation, of this report. In confined areas, subgrade preparation must consist of the removal of all loose or disturbed soils.

5.3 DRILLED PIERS

5.3.1 Design Data

To control long-term settlements associated with collapse soils, we recommend that the structure be supported upon a drilled pier-grade beam system. The drilled piers should have a minimum diameter of 2.5 feet and extend to the very dense granular soils encountered at depths of 23.0 to 27.5 feet in the deeper borings.

Since the soils above the dense granular soils are predominantly fine-grained and cohesive either straight shaft or belled piers can be used. The diameter of the bells should not exceed 2.5 times the diameter of the straight shaft.

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[1] American Association of State Highway and Transportation Officials
[2] American Society for Testing and Materials

For design, we recommend that an end-bearing value of 40,000 pounds per square foot be used for piers with a base diameter not exceeding 48-inches. For a 60-inch base diameter, the bearing pressure should be reduced to 33,000 pounds per square foot. These bearing pressures consider downdrag if collapsible soils were to settle. For seismic loading, the bearing pressure may be increased by 50 percent.

Side friction/adhesive should not be considered. Uplift capacity is essentially the weight of the pier.

5.3.2 Installation

The drilled piers should only be installed by a contractor with a well established record of satisfactory performance in similar conditions.

<u>Since the capacity of each drilled pier is based solely upon end-bearing, it is essential that the base of each pier be totally clean prior to pouring concrete. This can be accomplished by vacuuming the base of the excavation or by hand cleaning. If hand cleaned, the maximum shaft diameter should be at least 36 inches. In addition, full-depth casing, safety harness, air quality equipment, etc. must be provided</u>.

If a pier group is required, we recommend that they have a sidewall or bell edge separation of at least two feet. Excavated piers will most likely have to be cased during drilling of adjacent piers or the first pier poured and allowed to set for at least 48-hours before the adjacent pier is excavated.

Group capacity reduction will not be a factor for pier end-bearing on the dense granular soils.

5.3.3 Settlements

Settlement of the piers designed and installed in accordance with the above recommendations, and supporting maximum anticipated loads as discussed in Section 2., Proposed Construction, should not exceed one-half to five-eighths of an inch.

5.4 LATERAL RESISTANCE

Lateral loads imposed upon drilled pier due to wind or seismic forces may be resisted by the development of passive earth pressures against the upper portion of the shafts. Assuming that the soils are collapsible and saturated or near-saturated, an equivalent passive fluid pressure of 450 pounds per cubic foot is recommended. This value should be applied to the actual diameter of the pier but considers that the load will be distributed out into projected area three times the shaft diameter.

5.5 LATERAL PRESSURES

The lateral pressure parameters, as presented within this section, assume that the backfill will consist of silty or clayey granular soil placed and compacted in accordance with the recommendations presented herein. The lateral pressures imposed upon subgrade facilities will, therefore, be basically dependent upon the relative rigidity and movement of the backfilled structure. For moderately rigid basement or tunnel walls that are not more than 10 inches thick and 12 feet or less in height, granular backfill may be considered equivalent to a fluid with a density of 60 pounds per cubic foot. For very rigid non-yielding walls, the backfill should be considered equivalent to a fluid with a density of at least 90 pounds per cubic foot. The above values assume that the surface of the soil slope behind the wall is horizontal, that the granular fill has been placed and lightly compacted, not as a structural fill. If the fill is placed as a structural fill, the values should be increased 80 pounds per cubic foot and 120 pounds per cubic foot, respectively.

The above equivalent fluid pressures are for static loading conditions. All of the equivalent fluid pressures should be increased by 15 pounds per cubic foot for dynamic lateral pressures which would be imposed during a moderately severe seismic event. It should be noted that the lateral pressures, as quoted, assume that the backfill materials will not become saturated.

5.6 FLOOR SLABS

Because of the presence of variable collapsible soil, we recommend that the first level slabs with the buildings be structurally supported by the drilled pier-grade beam foundation system.

Settlement of structurally supported floor slabs should be negligible.

If floor slabs are established directly upon the natural soil sequence, settlements of one to two inches could be experienced if the underlying soil becomes saturated or near-saturated.

5.7 GEOSEISMIC SETTING

5.7.1 General

The site is located within "Seismic Zone 3" as defined by the Seismic Zone Map of the United States in the Uniform Building Code (UBC) 1997 edition. Seismic Zone 3 is expected to experience moderately frequent, potentially damaging earthquakes. In terms of damage potential, Seismic Zone 3 is second only to Zone 4, which includes parts of California, Nevada, Hawaii, and Alaska. As a minimum, the criteria for lateral forces stated within the UBC for Seismic Zone 3 should be incorporated into the design of the proposed structure.

5.7.2 Faulting

Based upon our review of available literature and data obtained in conjunction with this investigation, no active faults are known to pass through or immediately adjacent to the site.

5.7.3 Liquefaction

Liquefaction is defined as the condition when saturated, loose, fine sand-type soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. Clayey soils, even if saturated, will not liquefy during a major seismic event.

Due to the lack of a shallow water table, the soils encountered at the site have a low probability of liquefaction due to their clay content.

5.7.4 Soil Profile Type

For dynamic structural analyses, the Soil Profile Type "S_D, Stiff Soil Profile" as defined by in Table 16-J of the UBC 1997 may be utilized.

We appreciate the opportunity of providing this service for you. If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

AMEC Earth & Environmental, Inc.

Michael S. Huber
Staff Engineer

Reviewed by

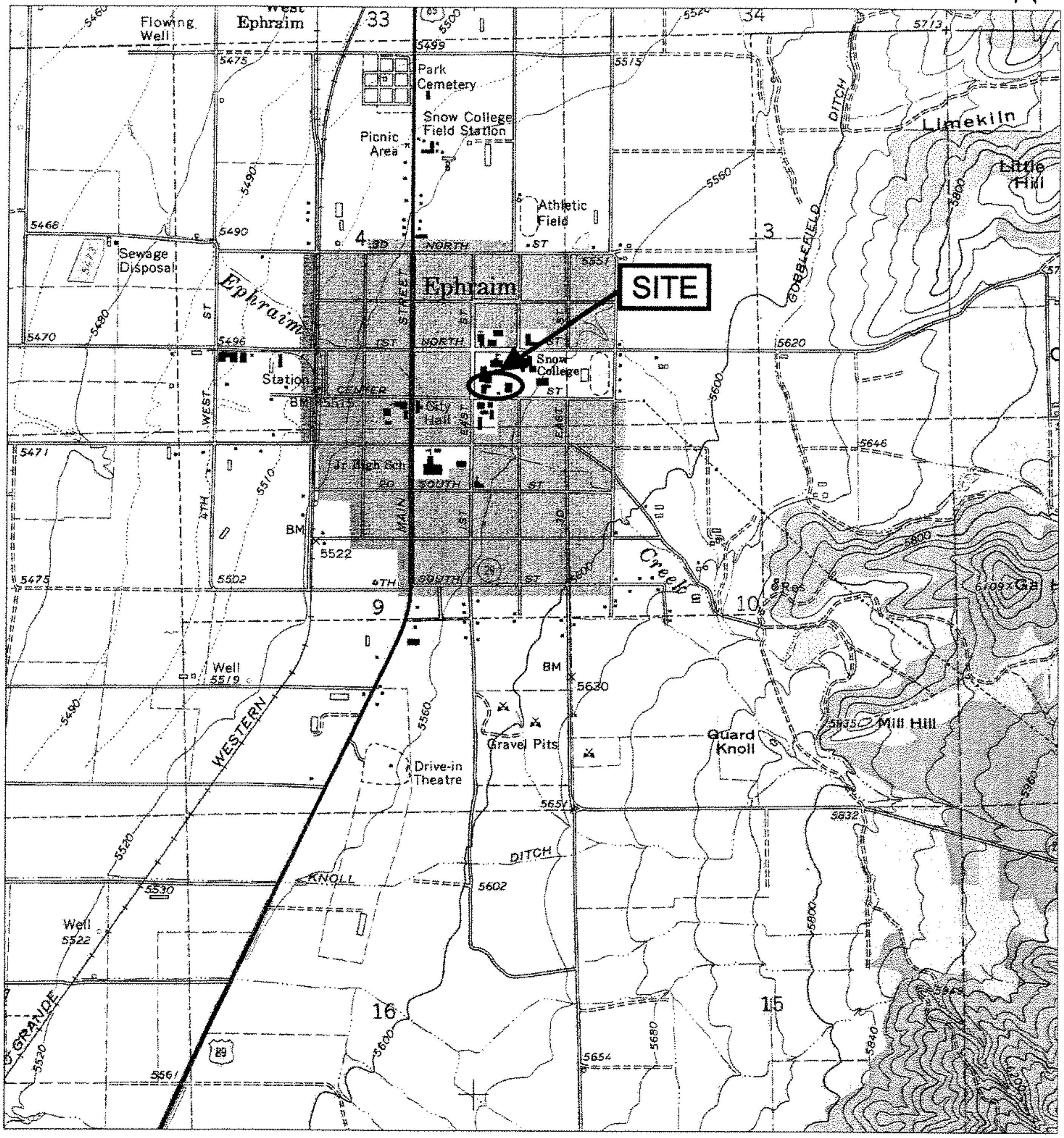
William J. Gordon, State of Utah No. 146417
Professional Engineer

MSH/WJG:sn

Encl. Figure 1, Vicinity Map
Figure 2, Site Plan
Figures 3A through 3H, Log of Borings
Figure 4, Unified Soil Classification System

Addressee (6)

STATE OF UTAH - DFCM
JOB NO. 1-817-003579



SCALE IN FEET

1000 0 1000 2000

FIGURE 1
VICINITY MAP

REFERENCE:
USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAP
TITLED "EPHRAIM, UTAH"
DATED 1966

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LOG OF TEST BORING NO. B-1

PROJECT Performing Arts Center/Classrooms Building
Snow College Campus, Ephraim, Utah

JOB NO. 1-817-003579 DATE 06-21-01

RIG TYPE CME 550
BORING TYPE 3-3/4" ID Hollow-Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										4" ASPHALT
								GP/GM/FILL		8" ROADBASE; fine to coarse sandy silt and gravel; brown; FILL
								ML/CL	moist medium stiff to stiff	ALTERNATING LAYERS TO 4" OF CLAYEY SILT, SILTY CLAY, AND FINE SANDY SILT; brown with trace black pockets
				D	11	97	20.3			
5								CL	moist medium stiff	SILTY CLAY with some fine sand; brown with occasional clayey silt layers to 3"; trace fine root/pinholes
				D	8	99	19.7			
10				D	27					grades without root/pinholes
								SM/GM	dry medium dense	SILTY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL; brown
15				D	28					grades to alternating layers to 6" of silty fine to coarse sandy fine gravel and silty fine to medium sand
20				D	23				very moist loose	grades with frequent fine silty sand/silty fine sand layers to 4"
								CL/ML	very moist	ALTERNATING LAYERS TO 6" OF SILTY CLAY, CLAYEY SILT,
25										

GROUNDWATER

DEPTH	HOUR	DATE
	*	

SAMPLE TYPE

A - Auger cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
D - 3 1/4" O.D. 2.42" I.D. tube sample.
C - California Split Spoon Sample

FIGURE 3A

amec

LOG OF TEST BORING NO. B-1

PROJECT: Performing Arts Center/Classrooms Building, Snow College Campus, Ephraim, Utah

JOB NO. 1-817-003579 DATE 06-21-01

RIG TYPE: CME 550
BORING TYPE: 3-3/4" ID Hollow-Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration 3Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
25				D	10					AND FINE SANDY SILT; brown
								GM	very moist very dense	**SILTY AND FINE TO COARSE SANDY FINE AND COARSE GRAVEL**; brown
30				D	135					
										grades with occasional cobble
35				D	139					
40				D	150					
45										Stopped drilling at 40.0'. Stopped sampling at 41.5'. * Groundwater not encountered. Installed 1 1/4" diameter slotted PVC pipe to 40.0'. The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary to a proper understanding of the nature of the subsurface materials.
50										

GROUNDWATER

	DEPTH	HOUR	DATE
∇		*	
▼			

SAMPLE TYPE

A - Auger cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
D - 3 1/4" O.D. 2.42" I.D. tube sample.
C - California Split Spoon Sample

FIGURE 3A
(con't)

amec

PROJECT Performing Arts Center/Classrooms Building
Snow College Campus, Ephraim, Utah
JOB NO. 1-817-003579 DATE 06-21-01

LOG OF TEST BORING NO. B-2

RIG TYPE CME 550
BORING TYPE 3-3/4" ID Hollow-Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								ML	moist "loose"/ "medium dense"	**FINE TO MEDIUM SANDY AND CLAYEY SILT**; major roots (topsoil) to 4"; dark brown
				D	6	91	22.8	CL	moist medium dense	**SILTY CLAY** with some fine sand and trace fine gravel; trace pinholes/rootholes; brown
5				D	10			ML	moist medium dense/loose	**ALTERNATING LAYERS TO 1" OF CLAYEY SILT AND FINE SANDY SILT**; brown
10				D	17					grades with occasional silty clay layers
								SM/ SP	slightly moist loose	**FINE TO MEDIUM SAND** with sandy silt; brown
								GM/ SM	"medium dense"	**SILTY FINE TO COARSE SAND AND FINE GRAVEL**; brown
								CL/ ML	moist stiff	**ALTERNATING LAYERS TO 6" SILTY CLAY AND CLAYEY SILT** with occasional fine sandy silt, silty fine to coarse sand, silty fine and coarse gravel, and silty clay layers to 1"; brown
15				D	19	103	19.5			
20				D	14	107	21.4			grades to alternating layers to 6" of silty clay, clayey silt with some fine sand and fine sandy silt; brown
25										

GROUNDWATER

	DEPTH	HOUR	DATE
▽		*	
▼			

SAMPLE TYPE

A - Auger cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
D - 3 1/4" O.D. 2.42" I.D. tube sample.
C - California Split Spoon Sample

FIGURE 3B

amec

PROJECT Performing Arts Center/Classrooms Building
Snow College Campus, Ephraim, Utah

JOB NO. 1-817-003579 DATE 06-21-01

LOG OF TEST BORING NO. B-2

RIG TYPE CME 550
BORING TYPE 3-3/4" ID Hollow-Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
25				D	92			GM	very dense	**SILTY AND FINE TO COARSE SANDY FINE AND COARSE GRAVEL**; brown
30				D	153					
35				D	88					
										Stopped drilling at 35.0'. Stopped sampling at 36.5'. * Groundwater not encountered.
40										
45										The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary to a proper understanding of the nature of the subsurface materials.
50										

GROUNDWATER

	DEPTH	HOUR	DATE
∇		*	
▼			

SAMPLE TYPE
A - Auger cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
D - 3 1/4" O.D. 2.42" I.D. tube sample.
C - California Split Spoon Sample

FIGURE 3B
(con't)

amec

PROJECT Performing Arts Center/Classrooms Building
Snow College Campus, Ephraim, Utah

LOG OF TEST BORING NO. B-3

JOB NO. 1-817-003579 DATE 06-21-01

RIG TYPE CME 550
BORING TYPE 3-3/4" ID Hollow-Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								CL FILL	dry "medium stiff" to "stiff"	**SILTY CLAY**; major roots (topsoil) to 4"; dark brown; FILL grades with some fine and coarse gravel
			X	D	12					
								CL/ ML	moist to very moist stiff	**FINE TO MEDIUM SANDY CLAY AND CLAYEY SILT**; trace rootholes/pinholes; gray
			X	D	7	82	21.0	ML/ CL	moist medium stiff/ loose	**ALTERNATING LAYERS TO 6" OF FINE SANDY SILT, SILTY CLAY, AND CLAYEY SILT**
5										
			X	D	11	101	22.8			
10										
								ML/ SM	slightly moist to moist loose	**ALTERNATING LAYERS TO 8" SILTY FINE TO MEDIUM SAND AND FINE SANDY SILT** with occasional silty clay layers to 5"
			X	D	12					
15										
										grades with occasional layers containing some fine gravel
			X	D	48					
20										
								GM	slightly moist very dense	**SILTY FINE TO COARSE SANDY FINE AND COARSE GRAVEL**; brown
			X	D	152					
25										

GROUNDWATER

	DEPTH	HOUR	DATE
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SAMPLE TYPE
A - Auger cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
D - 3 1/4" O.D. 2.42" I.D. tube sample.
C - California Split Spoon Sample

FIGURE 3C

amec

LOG OF TEST BORING NO. B-3

PROJECT: Performing Arts Center/Classrooms Building, Snow College Campus, Ephraim, Utah

JOB NO. 1-817-003579 DATE 06-21-01

RIG TYPE: CME 550
BORING TYPE: 3-3/4" ID Hollow-Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
25										
30										Stopped drilling at 24.0'. Stopped sampling at 25.5'. * Groundwater not encountered.
35										
40										
45										
50										The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary to a proper understanding of the nature of the subsurface materials.

GROUNDWATER

	DEPTH	HOUR	DATE
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SAMPLE TYPE

A - Auger cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
D - 3 1/4" O.D. 2.42" I.D. tube sample.
C - California Split Spoon Sample

FIGURE 3C (con't)

amec

LOG OF TEST BORING NO. B-4

PROJECT: Performing Arts Center/Classrooms Building, Snow College Campus, Ephraim, Utah

JOB NO. 1-817-003579 DATE 06-21-01

RIG TYPE: CME 550
BORING TYPE: 3-3/4" ID Hollow-Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								ML/ CL FILL	dry "medium stiff"	**FINE TO MEDIUM SANDY CLAY AND SILT**; major roots (topsoil) to 4"; brown; FILL
			X	D	11			ML/ SM/ CL	slightly moist medium stiff/ loose	**ALTERNATING POCKETS AND LAYERS TO 2" OF FINE SANDY SILT, SILTY FINE SAND, CLAYEY SILT, AND SILTY CLAY**; brown to red-brown; FILL
5			X	D	17	85	13.7	CL/ ML	dry stiff	**SILTY CLAY/CLAYEY SILT** with some fine sand; trace to some pinholes/rootholes; light brown
10			X	D	18					
									slightly moist	
15			X	D	21	92	13.8			grades with frequent silty clay layers to 5"; trace to some rootholes/pinholes
20			X	D	17	92	8.9			grades with trace pinholes and with frequent fine silty sand and silty fine sand layers to 3"
								GM/ ML	slightly moist medium dense	**ALTERNATING LAYERS TO 12" OF SILTY FINE TO COARSE SAND, FINE AND COARSE GRAVEL, AND FINE TO**
25										

GROUNDWATER

DEPTH	HOUR	DATE
	*	

SAMPLE TYPE

A - Auger cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
D - 3 1/4" O.D. 2.42" I.D. tube sample.
C - California Split Spoon Sample

FIGURE 3D

amec

PROJECT Performing Arts Center/Classrooms Building
Snow College Campus, Ephraim, Utah

JOB NO. 1-817-003579 DATE 06-21-01

LOG OF TEST BORING NO. B-4

RIG TYPE CME 550
BORING TYPE 3-3/4" ID Hollow-Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
25				D	25					**MEDIUM SANDY AND CLAYEY SILT**; brown
								GM	slightly moist to moist very dense	**SILTY FINE TO COARSE SANDY FINE AND COARSE GRAVEL**; brown
30				D	170					
										Stopped drilling at 30.0'. Stopped sampling at 31.5'.
35										
40										
45										
50										The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary to a proper understanding of the nature of the subsurface materials.

GROUNDWATER

	DEPTH	HOUR	DATE
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SAMPLE TYPE
A - Auger cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
D - 3 1/4" O.D. 2.42" I.D. tube sample.
C - California Split Spoon Sample

FIGURE 3D
(con't)

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PROJECT Performing Arts Center/Classrooms Building
Snow College Campus, Ephraim, Utah

LOG OF TEST BORING NO. B-5

JOB NO. 1-817-003579 DATE 06-22-01

RIG TYPE CME 550
BORING TYPE 3-3/4" ID Hollow-Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								ML/CL	very moist medium dense	**ALTERNATING LAYERS TO 6" OF SILTY CLAY AND CLAYEY SILT** with some fine sand; brown
				D	6					
				D	7					
5										
				D	3	104	24.1			grades with frequent fine sandy silt layers to 6"; trace pinholes/rootholes
10										
								CL/ML/SM	slightly moist medium stiff to stiff/loose	**ALTERNATING LAYERS TO 6" OF SILTY CLAY, CLAYEY SILT, SILTY FINE SAND, AND FINE SANDY SILT**; trace fine pinholes/rootholes; brown
				D	11					
15										Stopped drilling at 13.5'. Stopped sampling at 15.0'. * Groundwater not encountered.
20										
25										The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary to a proper understanding of the nature of the subsurface materials.

GROUNDWATER

DEPTH	HOUR	DATE
	*	

SAMPLE TYPE

A - Auger cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
D - 3 1/4" O.D. 2.42" I.D. tube sample.
C - California Split Spoon Sample

FIGURE 3E

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LOG OF TEST BORING NO. B-6

PROJECT Performing Arts Center/Classrooms Building
Snow College Campus, Ephraim, Utah

JOB NO. 1-817-003579 DATE 06-22-01

RIG TYPE CME 550
BORING TYPE 3-3/4" ID Hollow-Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			X	D	9	96	21.5	CL FILL	moist medium stiff	**FINE AND COARSE GRAVELLY CLAY** with some fine to coarse sand; major roots (topsoil) to 4"; brown; FILL grades without gravel
			X	D	19	91	16.0	CL/ ML	slightly moist stiff	**ALTERNATING LAYERS TO 4" OF SILTY CLAY WITH TRACE SAND AND CLAYEY SILT WITH SOME SAND**; trace to some rootholes/pinholes with occasional fine sandy silt layers to 1"; brown
5			X	D	pushed					grades with alternating layers of fine sandy silt, silty clay, and clayey silt with trace fine pinholes
			X	D	9	99	15.9		medium stiff	grades without pinholes
10										
			X	D	9				very moist	
15										Stopped drilling at 14.0'. Stopped sampling at 15.5'. * Groundwater not encountered.
20										
25										The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary to a proper understanding of the nature of the subsurface materials.

GROUNDWATER

DEPTH	HOUR	DATE
	*	

SAMPLE TYPE

A - Auger cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
D - 3 1/4" O.D. 2.42" I.D. tube sample.
C - California Split Spoon Sample

FIGURE 3F

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PROJECT Performing Arts Center/Classrooms Building
Snow College Campus, Ephraim, Utah
JOB NO. 1-817-003579 DATE 06-22-01

LOG OF TEST BORING NO. B-7

RIG TYPE CME 550
BORING TYPE 3-3/4" ID Hollow-Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								CL FILL	moist "soft" to "medium stiff"	**SILTY CLAY** with some fine to medium sand; major roots (topsoil) to 4"; brown; FILL
				D	14			CL/ML FILL	moist stiff	**ALTERNATING LAYERS TO 3" OF SILTY CLAY, CLAYEY SILT, AND FINE TO COARSE SANDY SILT** with some fine and coarse gravel; brown; FILL
5				D	11	100	22.3	CL	very moist medium stiff to stiff	**SILTY CLAY** with numerous clayey silt and fine sandy silt layers to 1"; brown
10				D	12					
15				D	34					
								SM/GC	very moist medium dense	**ALTERNATING LAYERS TO 12" OF SILTY FINE TO MEDIUM SAND AND CLAYEY AND FINE TO COARSE SANDY FINE AND COARSE GRAVEL**; brown
20										Stopped drilling at 15.0'. Stopped sampling at 16.5'. * Groundwater not encountered. The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary to a proper understanding of the nature of the subsurface materials.
25										

GROUNDWATER

	DEPTH	HOUR	DATE
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▼			

SAMPLE TYPE

A - Auger cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
D - 3 1/4" O.D. 2.42" I.D. tube sample.
C - California Split Spoon Sample

FIGURE 3G

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PROJECT Performing Arts Center/Classrooms Building
Snow College Campus, Ephraim, Utah

LOG OF TEST BORING NO. B-8

JOB NO. 1-817-003579 DATE 06-22-01

RIG TYPE CME 550
BORING TYPE 3-3/4" ID Hollow-Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			X	D	25			CL/ ML FILL	dry medium stiff to stiff	**FINE TO COARSE SANDY AND GRAVELLY CLAY AND SILT;** major roots (topsoil) to 4"; dark brown; FILL
			X					CL	moist stiff	**SILTY CLAY** with some fine sand; brown
5			X	D		97	24.0			grades with frequent clayey silt and fine sandy silt layers to 1"; trace fine pinholes; brown
			X	D	11	97	21.3	CL/ ML/ SM	moist stiff/loose	**ALTERNATING LAYERS TO 4" OF SILTY CLAY, CLAYEY SILT, AND SILTY FINE SAND;** brown
10										
			X	D	16					
15										Stopped drilling at 13.5'.
										Stopped sampling at 15.0'.
										* Groundwater not encountered.
20										
25										The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary to a proper understanding of the nature of the subsurface materials.

GROUNDWATER

	DEPTH	HOUR	DATE
▽		*	
▼			

SAMPLE TYPE

A - Auger cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
D - 3 1/4" O.D. 2.42" I.D. tube sample.
C - California Split Spoon Sample

FIGURE 3H

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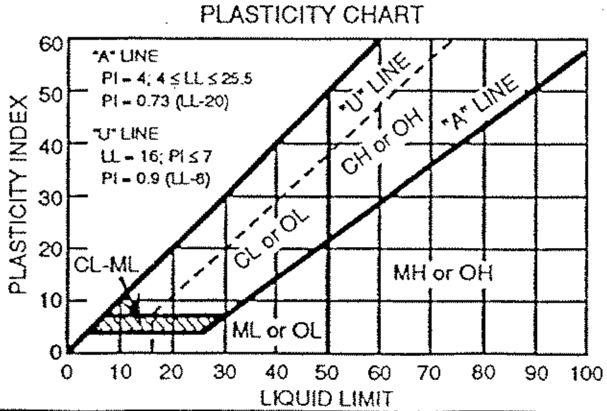
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified for engineering purposes by the Unified Soil Classification System. Grain-size analyses and Atterberg Limits tests often are performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. Graphic symbols are used on boring logs presented in this report. For a more detailed description of the system, see "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)" ASTM Designation: 2488-84 and "Standard Test Method for Classification of Soils for Engineering Purposes" ASTM Designation: 2487-85.

MAJOR DIVISIONS				GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures
					GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures
			Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (50% or more of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)			SW	Well graded sands, gravelly sands
					SP	Poorly graded sands, gravelly sands
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures
			Limits plot above "A" line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS Limits plot below "A" line & hatched zone on plasticity chart	SILTS OF LOW PLASTICITY (Liquid Limit less than 50)			ML	Inorganic silts, clayey silts of low to medium plasticity
		SILTS OF HIGH PLASTICITY (Liquid Limit 50 or more)			MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts
	CLAYS Limits plot above "A" line & hatched zone on plasticity chart	CLAYS OF LOW PLASTICITY (Liquid Limit less than 50)			CL	Inorganic clays of low to medium plasticity, gravelly, sandy, and silty clays
		CLAYS OF HIGH PLASTICITY (Liquid Limit 50 or more)			CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity
	ORGANIC SILTS AND CLAYS	ORGANIC SILTS AND CLAYS OF LOW PLASTICITY (Liquid Limit less than 50)			OL	Organic silts and clays of low to medium plasticity, sandy organic silts and clays
		ORGANIC SILTS AND CLAYS OF HIGH PLASTICITY (Liquid Limit 50 or more)			OH	Organic silts and clays of high plasticity, sandy organic silts and clays
ORGANIC SOILS		PRIMARILY ORGANIC MATTER (dark in color and organic odor)			PT	Peat

NOTE: Coarse-grained soils with between 5% and 12% passing the No. 200 sieve and fine-grained soils with limits plotting in the hatched zone on the plasticity chart have dual classifications.

PLASTICITY CHART



DEFINITION OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Boulders	Above 12 in.
Cobbles	12 in. to 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to 3/4 in.
Fine gravel	3/4 in. to No. 4 sieve
Sand	No. 4 to No. 200 sieve
Coarse sand	No. 4 to No. 10 sieve
Medium sand	No. 10 to No. 40 sieve
Fine sand	No. 40 to No. 200 sieve
Fines (silt and clay)	Less than No. 200 sieve

FIGURE 4

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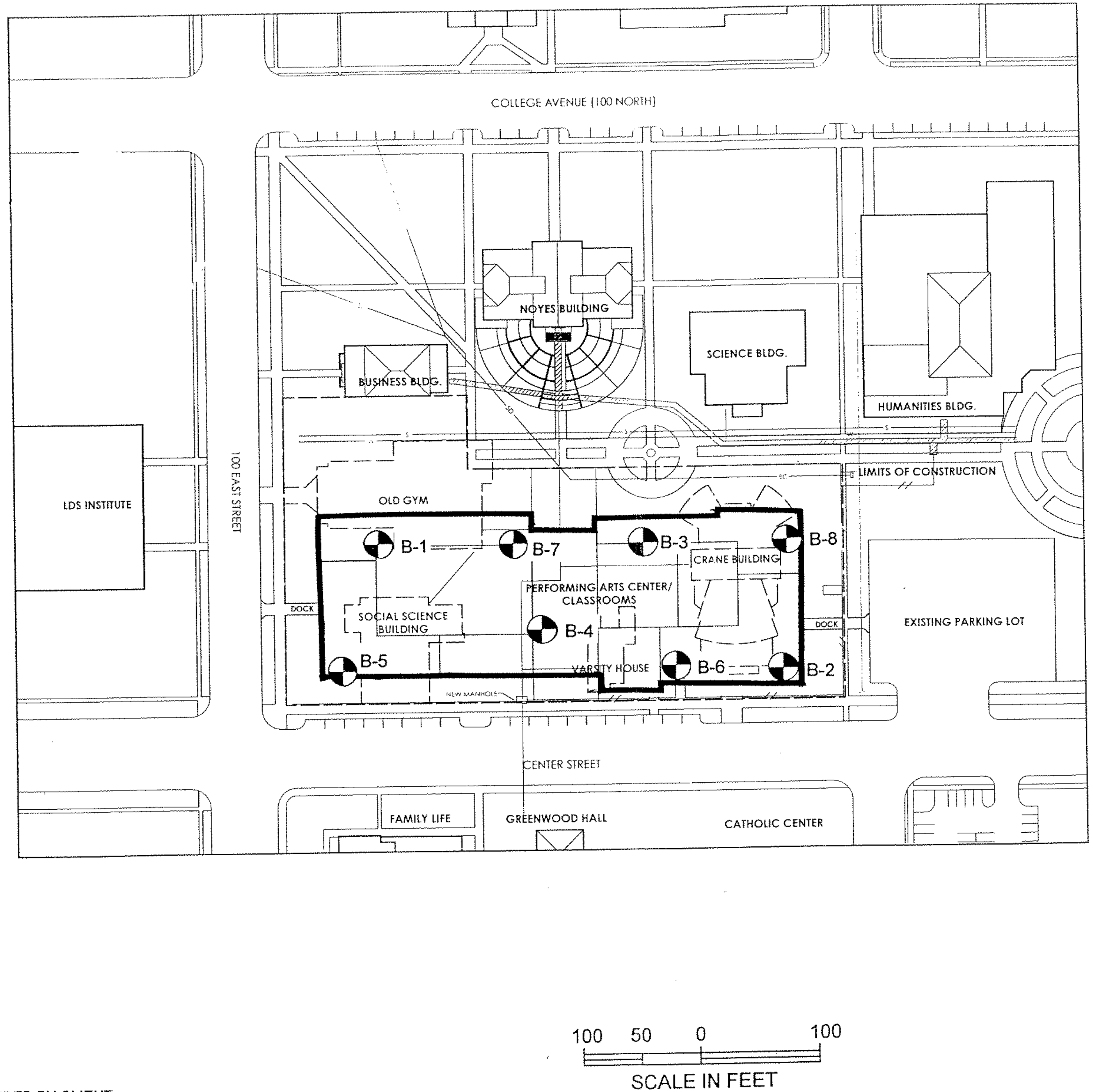
STATE OF UTAH DFCM
JOB NO. 1-817-003579



Key

(symbol)	Approximate Boring Location
- - -	Buildings to be Demolished
▬	Proposed Performing Arts Center/Classrooms

FIGURE 2
SITE PLAN

amec

REFERENCE:
ADAPTED FROM DRAWING PROVIDED BY CLIENT

N068544